

Health of King County 2006

Chapter 9: Environmental Health

Asthma Hospitalizations

Indoor and Outdoor Air Quality

West Nile Virus

Water Quality and Waterborne Illnesses

Tacoma Smelter Plume

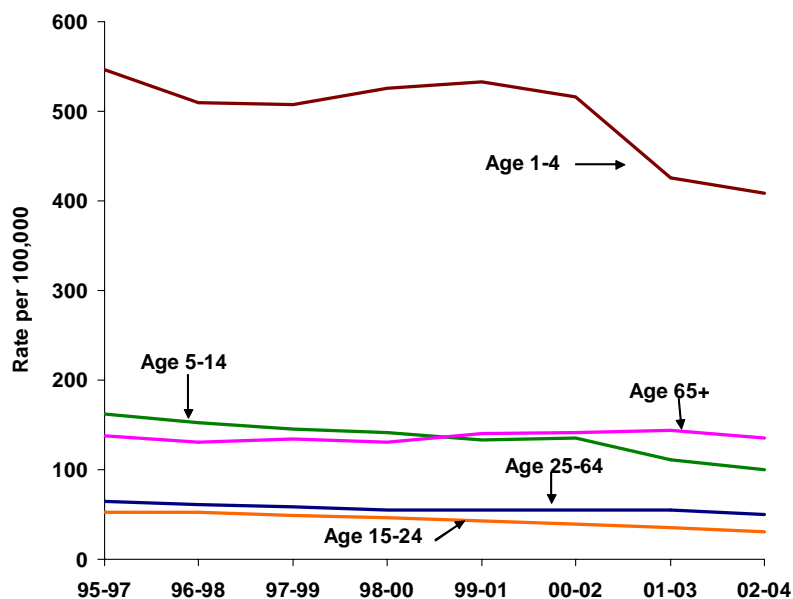
Asthma Hospitalizations

- Asthma is the most common chronic childhood illness and contributes to many missed school and work days. Nationally, children with asthma average 2.5 missed days of school due to the disease.¹
- Hospitalizations for asthma, especially for children, reflect more than just the underlying prevalence of the condition. With adherence to treatment plans, asthma hospitalizations can be reduced.
- Asthma hospitalizations are considered an indicator for problems accessing primary care, finding affordable medications, correct use of medications, and home treatment equipment.
- King County asthma hospitalizations have declined dramatically since 2001, especially in children.
- HP 2010 goals are to reduce the rate of asthma hospitalizations in three age categories: children under 5, 250 per 100,000, ages 5 to 64, 77 per 100,000, and ages 65 and older, 110 per 100,000.
- For 2004, King County met the ages 5 to 64 goal with 47 asthma hospitalizations per 100,000. We were still higher for the under age 5 category (390 per 100,000) and 65 and older (123 per 100,000).
- In 2004, among King County residents of all ages, asthma hospitalizations cost \$11.8 million, or \$8,826 per hospitalization.² Please see [Asthma in King County](#) for more information about asthma.
- King County has a number of programs targeting asthma prevention and control. The decrease in asthma hospitalizations has occurred simultaneously with the implementation of some of these programs.
- The childhood asthma hospitalization rate has seen the most dramatic reduction, although the adult asthma hospitalization rate has also lessened. (See [Public Health Core Indicators](#) for more information).
- With continued efforts and effective programs, the decreasing trend is likely to continue.

King County and Regions

- The hospitalization rate was highest among children aged 1 to 4 and adults 65 and older.
- Childhood asthma hospitalization was significantly higher in males than in females, in younger age groups (<1 and 1-4 years of age), in high poverty neighborhoods, and in Seattle (data not shown).
- Asthma hospitalizations significantly decreased for children aged 0 to 17 in the last 10 years. However, the decrease occurred between 2000 and 2004. Childhood asthma hospitalization dropped most dramatically between 2002 and 2003, by 31%.
- Common risk factors causing asthma or triggering asthma attacks include tobacco smoke, mold, house dust mites, cockroaches, rodents, cat and dog dander, nitrogen dioxide (such as from stoves), wood smoke, and some chemicals (such as formaldehyde from particle board).^{3,4} Other hazards include pollens, molds, and pollutants such as nitrogen dioxide, sulfur dioxide, ozone, and diesel exhaust particles.⁵

Asthma Hospitalization Trends by Age, Three Year Average, King County, 1995-2004

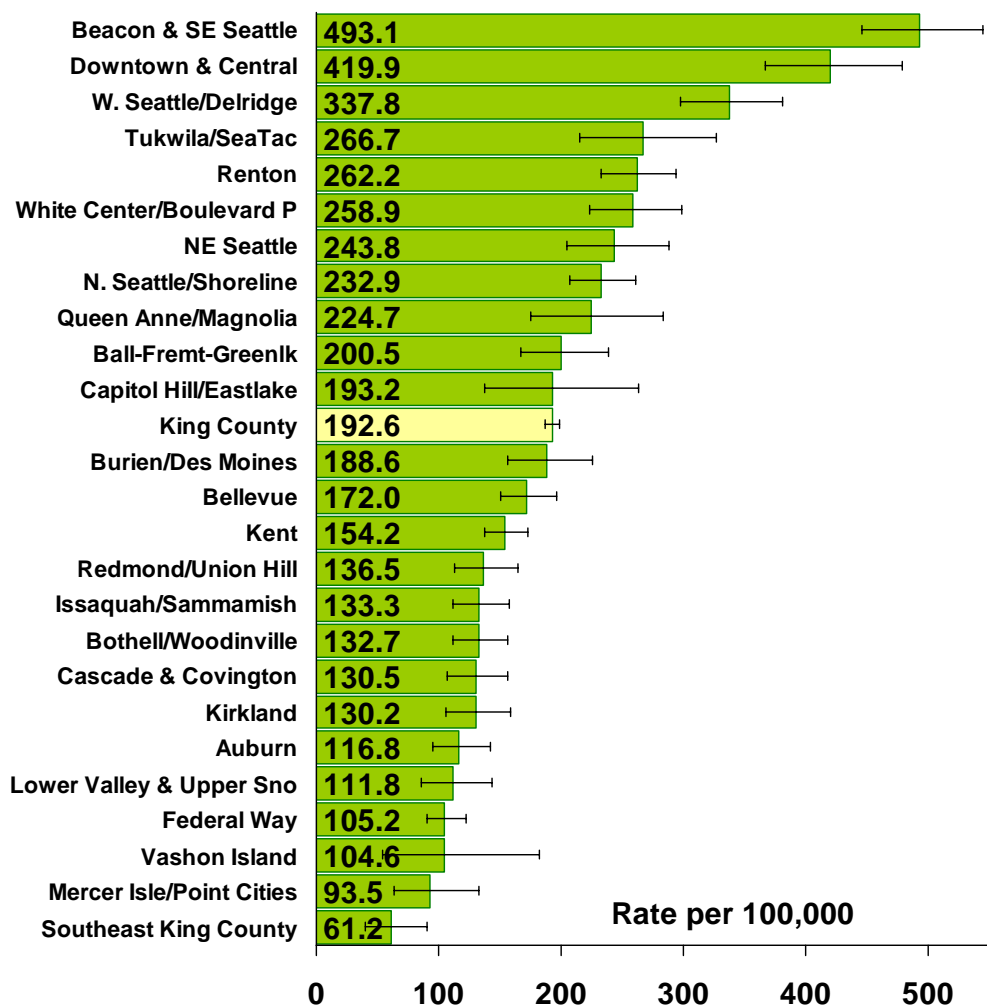


Data Source: Hospitalization Discharge Data, Washington State Department of Health, Office of Hospital and Patient Data Systems
Produced by: Epidemiology, Planning & Evaluation, Public Health - Seattle & King County

Patterns by Health Planning Area

- Beacon & Southeast Seattle, Downtown/Central, West Seattle/Delridge, Tukwila/SeaTac, Renton, White Center/Boulevard Park, and Northeast Seattle had significantly higher childhood asthma hospitalization rates than the King County average.
- Kent, Redmond/Union Hill, Issaquah/Sammamish, Bothell/Woodinville, Cascade/Covington, Kirkland, Auburn, Lower Valley/Upper Snoqualmie, Federal Way, Vashon Island, Mercer Isle/Point Cities, and Southeast King County had lower rates of childhood asthma hospitalization than the King County average.

**Childhood Asthma Hospitalizations by Health Planning Area,
King County Five Year Average, 2000-2004**

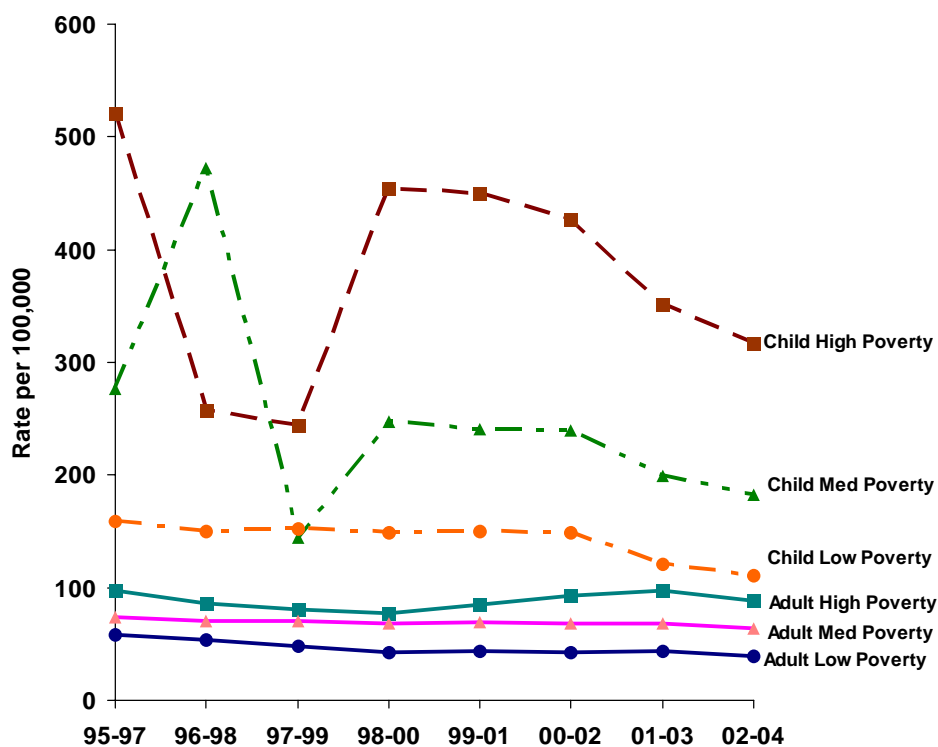


Data Source: Hospitalization Discharge Data, Washington State Department of Health, Office of Hospital and Patient Data Systems
Produced by: Epidemiology, Planning & Evaluation, Public Health - Seattle & King County

Focus on Disparities

- Race data are not collected by the hospitalization discharge data system. However, national research shows there to be a widening racial gap in asthma morbidity and mortality.^{6,7}
- Inequalities exist by neighborhood poverty level in children and adults.
- Adults living in high poverty neighborhoods⁸ are twice as likely to be admitted to the hospital for asthma compared to people from low poverty neighborhoods. The disparity is greater in children in high poverty neighborhoods, where they are 3 times more likely to be hospitalized for asthma than children in higher income areas.

Asthma Hospitalization Trends by Age and Community Poverty Level, Three Year Average, King County, 1995-2004



Data Source: Hospitalization Discharge Data, Washington State Department of Health, Office of Hospital and Patient Data Systems
Produced by: Epidemiology, Planning & Evaluation, Public Health - Seattle & King County

Resources

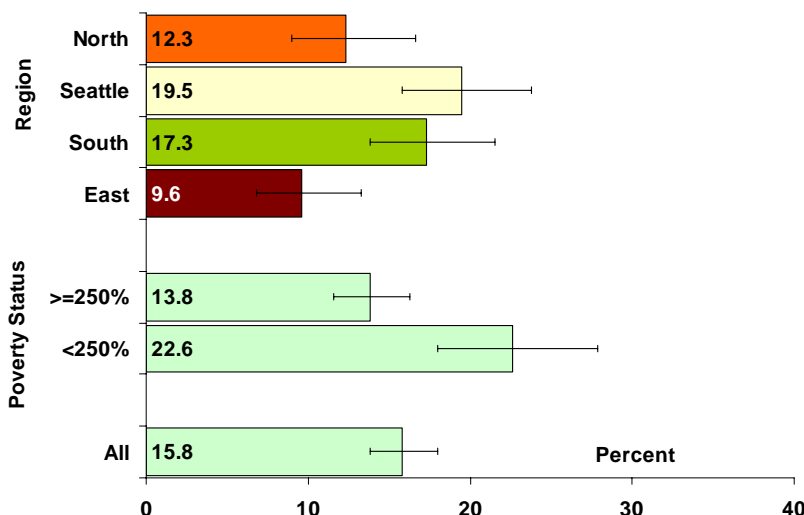
- ¹ Wang LY, Zhong Y, Wheeler L. Direct and indirect costs of asthma in school-age children. *Prev Chronic Dis*. 2005 Jan;2(1):A11. Epub 2004 Dec 15.
- ² Public Health Data Watch, Asthma in King County, King County, Seattle-King County Department of Public Health, Vol 8, No 2, 2005.
- ³ U.S. Environmental Protection Agency. Asthma and Indoor Environments. www.epa.gov/asthma/triggers.html
- ⁴ Institute of Medicine. Clearing the Air, Asthma and Indoor Exposures. National Academy Press. Washington, D.C.
- ⁵ Pandya RJ et al. Diesel Exhaust and Asthma: Hypotheses and Molecular Mechanisms of Action. *Environmental Health Perspectives*. 110(suppl 1): 103-112 (2002).
- ⁶ Grant EN, Wagner R, Weiss KB. Observations on emerging patterns of asthma in our society. *J Allergy Clin Immunol*. 104(2 Pt 2):S1-9, 1999
- ⁷ Gillum RF. Chronic obstructive pulmonary disease in blacks and whites: mortality and morbidity. *J Natl Med Assoc*. ;82(6):417-28, 1990.
- ⁸ Income is not collected for hospitalizations. Communities were assigned a poverty level based on the percent of population living below the Federal Poverty Level (\$17,500 for a family of four in 2000). High poverty neighborhoods had 15% or more living below the FPL, medium poverty: 5% to 14%, and low poverty: less than 5%.

Indoor and Outdoor Air Quality

Indoor Air Quality

- Much of the air quality regulatory focus is on outdoor air; however, most people spend as much as 90% of their time indoors. According to the Environmental Protection Agency (EPA), indoor pollutants may be considerably higher than outdoor levels.¹ Potential hazards include mold, pesticides, chemicals, airborne particles, cigarette and fireplace smoke, lead dust, and noise. Poor indoor air quality can be a trigger for asthma, which is one of the most common reasons for children to need hospital care.
- Health effects from indoor air pollutants may be experienced almost immediately after exposure (irritation of the eyes, nose, and throat, headaches, dizziness, asthma attack, hypersensitivity pneumonitis, and humidifier fever, and fatigue) or, possibly, years later. These effects, which include respiratory diseases, heart disease, and cancer, can be debilitating or fatal. It is recommended to try to improve the indoor air quality in your home even if there are no noticeable symptoms.
- There is no population-based source for indoor air quality, although the Behavioral Risk Factor Surveillance Survey (BRFSS), a telephone survey, asked respondents about having mold/mildew larger than the size of a dollar bill inside the home in the past year.
- Mold/mildew was more frequently seen in household where income was below 250% of the federal poverty level (FPL) as compared to those with household income over 250% of the FPL.
- People living in the Seattle and South Region were more likely to report seeing mold in the home than those living in the East Region.
- One in 4 adults with asthma had a large mold or mildew spot in their home, as compared to 1 in 6 adults with no asthma. (data not shown)

Percent of King County Adults Reporting Mold/Mildew* Inside The Home During The Past Year, 2004



*Covers an area at least the size of a dollar

Data Source: Behavioral Risk Factor Surveillance System.
Produced by: Epidemiology, Planning & Evaluation, Public Health, Seattle & King County

Pollutants in the home include²:

- Basic techniques for improving indoor air quality include improving ventilation by occasionally opening doors and windows, and installing and using fans in the kitchen and bathroom. Refrain from smoking in the home whenever possible and avoid the use of toxic household products. For alternative products, please visit <http://www.metrokc.gov/health/hazard/hazchems.htm>.

Carbon monoxide alarms can be installed to detect high levels of CO.

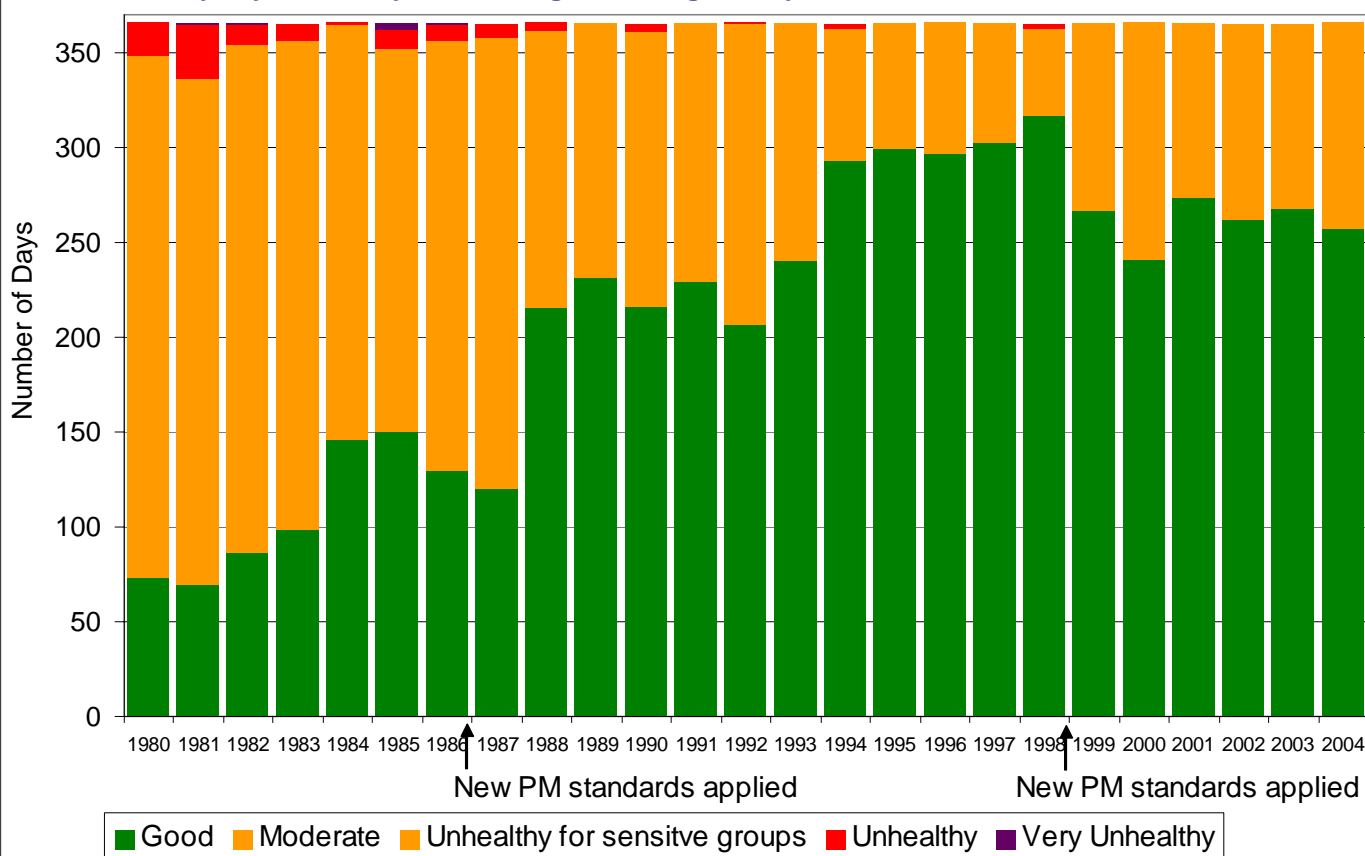
Pollutant	Source	Health effect	Exposure reduction
Radon (limited areas in King County)	Uranium in the soil or rock on which homes are built.	lung cancer.	Test. If levels are high, find a radon reducing expert
Environmental tobacco smoke (ETS)	Smoking from cigarettes, cigars, or pipes	asthma, asthma exacerbation, lower respiratory tract infections (pneumonia and bronchitis), and eye, nose, and throat irritation.	Don't smoke at home or allow others to do so. Ask smokers to smoke outdoors; if smoking indoors cannot be avoided, increase ventilation smoking area. Don't smoke around infants or toddlers.
Particulate matter, carbon monoxide, formaldehyde, nitrogen dioxide	Heating systems that burn oil, gas, kerosene, coal, or wood.	<p>Carbon monoxide: unconsciousness and death at high concentration. Lower concentration: headaches, dizziness, weakness, nausea, confusion, and fatigue.</p> <p>Nitrogen dioxide: eye, nose, and throat irritation, shortness of breath; increases respiratory infection; possibly emphysema</p> <p>Particulate matter: lodge in the lungs and irritate or damage lung tissue. Can cause cancer.</p>	<p>When operating fuel-burning unvented space heaters: keep the heater properly adjusted and follow manufacturer instructions. When in use, open the door to the room where the heater is located and open a window slightly.</p> <p>Use a stove hood and an outdoor-vented fan to reduce exposure when cooking. Consider a pilotless stove. Open the flue when using a gas fireplace. Keep woodstove emissions to a minimum. Choose properly sized new stoves certified as meeting EPA emission standards.</p> <p>Annual inspection of central air handling systems, including furnaces, flues, and chimneys and promptly repair cracks or damaged parts.</p>
Pesticides, herbicides, outdoor air pollution	Contaminated soil tracked in from outside, stored pesticide containers, products used in the home such as insecticides, termiticides, rodenticides, fungicides, and disinfectants	headaches, dizziness, muscle twitching, weakness, tingling sensations, and nausea. The EPA is concerned that cyclodienes might cause long-term damage to the liver and the central nervous system and increase risk of cancer.	<p>Read the label and follow the directions. It is illegal to use any pesticide in any manner inconsistent with the directions on its label.</p> <p>Ventilate the area well after pesticide use.</p> <p>Dispose of unwanted pesticides safely.</p> <p>Use non-chemical methods of pest control when possible.</p>
Asbestos	Primarily in older homes' pipe and furnace insulation materials, shingles, millboard, textured paints, and floor tiles	Asbestos can cause lung cancer, mesothelioma, and asbestosis	<p>Do not cut, rip, or sand asbestos-containing materials.</p> <p>When removing or cleaning up asbestos, use a professionally trained contractor.</p>
Lead	Lead can be a contaminant in the air, drinking water, food, or soil. The most common source today is older, deteriorating lead-based paint.	<p>High levels: Convulsions, coma, or death.</p> <p>Lower: Adversely effects on the brain, central nervous system, blood cells, and kidneys.</p> <p>Younger children are especially susceptible.</p>	<p>Keep areas where children play as dust-free and clean as possible.</p> <p>Do not remove lead paint yourself.</p> <p>Leave lead-based paint undisturbed if it is in good condition.</p> <p>Do not bring lead dust into the home.</p> <p>Eat right.</p>
Molds	Wet or damp surfaces	Sneezing, runny nose, red eyes, and skin rash (dermatitis), either immediate or delayed. Asthma trigger. Mold exposure can irritate the eyes, skin, nose, throat, and lungs.	<p>Control moisture indoors.</p> <p>Clean up and fix water leaks and spills promptly.</p> <p>Scrub mold off hard surfaces with detergent and water, and dry completely.</p> <p>Reduce humidity in your house.</p> <p>Increase ventilation or air movement by opening doors and/or windows, when practical. Use fans as needed.</p> <p>Increase air temperature.</p>

Outdoor Air Quality

- Outdoor air quality is measured by the Air Quality Index (AQI), a national system of gauging the condition of outside air with the potential to harm human health.³ The AQI measures carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, lead, and particulate matter. Particulate matter is particles of dust, soot, and unburned fuel that is suspended in the air.
- Poor air quality can significantly impact human health in a variety of ways. Pollutants contribute to respiratory disease development such as asthma, lung cancer, and chronic obstructive pulmonary disease (COPD). Increased mortality can also be attributed to days with poor air quality.^{4,5} Other ailments from air pollutants include eye nose and throat irritation, headaches, dizziness and fatigue.

- The AQI measures the amount of pollutants in the outdoor air from a score of 0 to 500. As the AQI goes higher, the level of air pollution and the health concern increases. There are six categories: good (0-50), moderate (51-100), unhealthy for sensitive people (101-150), unhealthy (151-200), very unhealthy (201-300), and hazardous (301-500).⁵
- King County generally has healthy air. Since 1986, King County has not had any days that were classified very unhealthy.
- In the past six years, King County has not had any days that fell in the unhealthy group.
- Washington State had 13 areas designated as “nonattainment” areas by the EPA. These areas experienced persistent air quality problems, and additional air pollution controls were required in these areas. King County was a nonattainment area for ozone and particulate matter, and the Duwamish and Kent Valley were nonattainment area for PM. However, Washington State worked to reduce the pollution in these areas. As of September 26th, 2005, all of Washington State is in compliance, and there are no nonattainment areas.⁶

Number of Days by Air Quality Index Categories, King County, 1980-2004



Data Source: United States Environmental Protection Agency Air Quality Index
Prepared by: Epidemiology, Planning and Evaluation, Public Health – Seattle & King County

Resources

- ¹ EPA Indoor Air Quality home page. <http://www.epa.gov/iaq/ia-intro.html>
- ² www.epa.gov/iaq/molds/moldguide.html
- ³ <http://cfpub.epa.gov/airnow/index.cfm?action=static.aqi>, Environmental Protection Agency
- ⁴ Scoggins A, Kjellstrom T, Fisher G, Connor J, Gimson N. Spatial analysis of annual air pollution exposure and mortality. *Sci Total Environ.* 321(1-3):71-85, 2004.
- ⁵ Maynard R, Krewski D, Burnett RT, Samet J, Brook JR, Granville G, Craig L. Health and air quality: directions for policy-relevant research. *J Toxicol Environ Health A.* 66(16-19):1891-904, 2003.
- ⁶ http://www.ecy.wa.gov/programs/air/other/namaps/Web_Map_Intro.htm

West Nile Virus in King County: Surveillance and Response

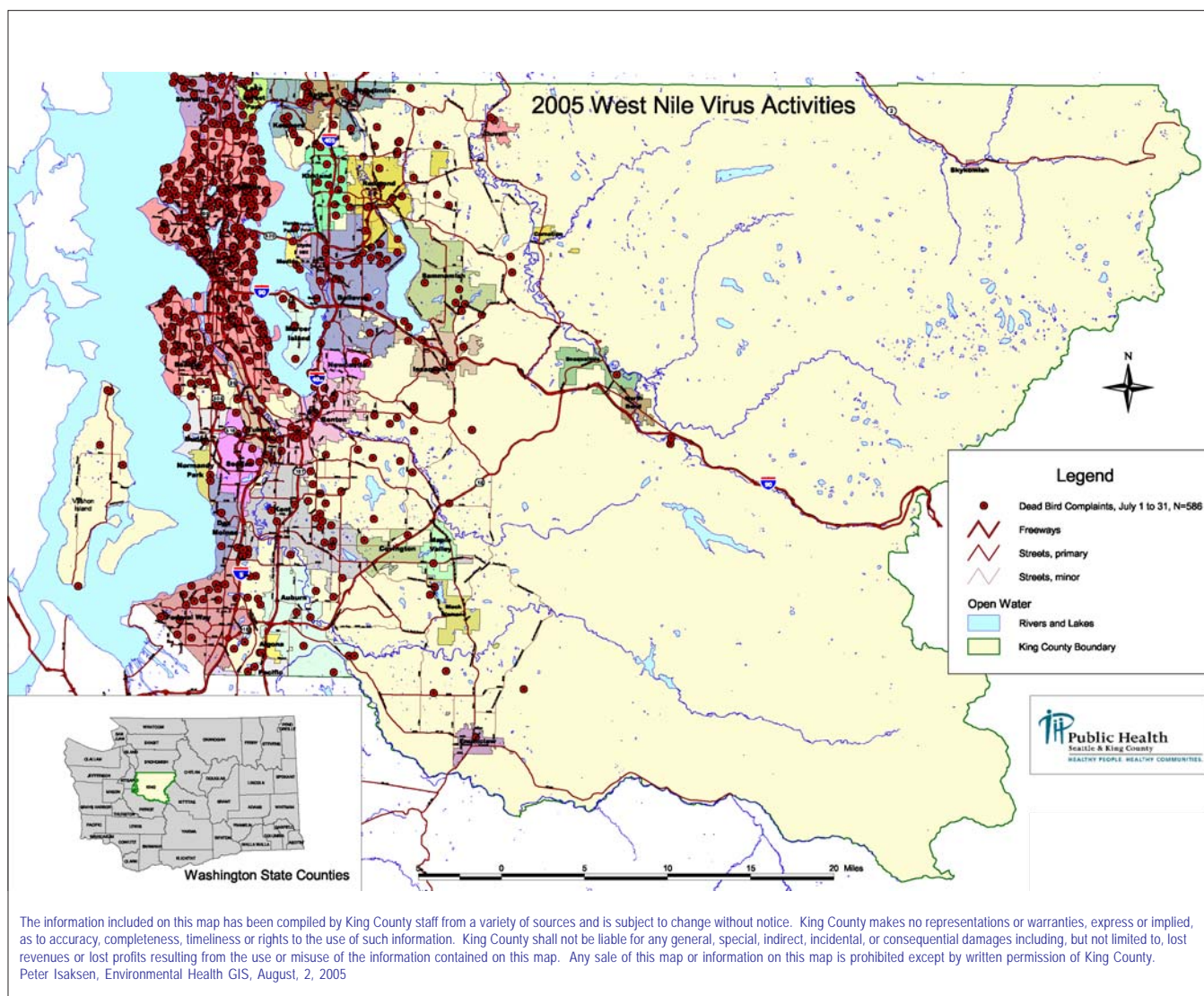
- West Nile virus is a mosquito-borne viral disease. While it has caused outbreaks in Africa, Asia, Eastern Europe and the Middle East for decades, it did not appear in the United States until 1999. Through 2005, West Nile virus had **not** been detected in people or animals in King County, but it has been found in several locations in Washington State starting in 2002.
- West Nile virus can infect humans, birds, mosquitoes, horses and other animals. Birds are the reservoirs for the virus in nature. Mosquitoes pick up the virus from birds then spread it by biting people. People are infected when they are bitten by a mosquito carrying West Nile virus.
- Symptoms range from mild to severe. A mild infection is the West Nile fever, with flu-like symptoms (fever, muscle aches, fatigue, headache, rash, and joint pain) that may last from a few days to several weeks. When the West Nile virus affects the nervous system (neuroinvasive disease), it causes swelling and inflammation of the brain or covering of the spinal cord and may result in paralysis and death. Symptoms of neuroinvasive disease may include fever, neck stiffness, confusion, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis.
- The majority of people who become infected with West Nile virus do not get sick. About 20% of those infected go on to develop West Nile fever. About 1 in 150 of persons infected with West Nile virus develop the more serious neuroinvasive form of the disease.
- In 2005, there were 2,744 cases of West Nile virus illnesses reported in the United States. Of these, 52% had West Nile fever and 43% had neuroinvasive disease.¹ In 2005, Washington was one of only 8 states (AK, HI, ME, NH, WV, VA, VT) that did not have a reported human case.²
- Please see [Communicable Disease](#) chapter for more information.

Surveillance for West Nile Virus

- Crows, blue jays, magpies, and birds of prey are very susceptible to West Nile virus and likely to die if infected. Monitoring reports of dead birds of these types and laboratory testing of birds are ways of detecting West Nile virus when it arrives in an area. Mosquitoes can also be tested.
- Public Health - Seattle & King County (PHSKC) monitors dead bird and mosquito complaints from citizens. Geographically-representative samples of dead birds and mosquitoes are collected for testing. People and horses with symptoms suggestive of West Nile virus are also tested, as are all blood donations.
- In 2005, PHSKC received and mapped over 2,700 dead bird reports in King County. Laboratory testing was performed on 110 dead birds, 21 pooled mosquito samples, 4 horses, and 4 people. All tests were negative for West Nile virus.

The figure below shows how PHSKC collects and tracks dead bird data.

- Public Health officials believe that West Nile virus eventually will occur in King County. Since its introduction to the eastern seaboard in 1999, West Nile virus has steadily made its way westward across the US. In 2003, the first human cases were seen in California and Idaho, followed by cases in Oregon in 2004. In these western states, West Nile virus cases have continued to climb: in California from 3 human cases in 2003 to 928 in 2005; in Idaho from 1 case in 2003 to 13 in 2005; and in Oregon from no cases in 2003 to 6 in 2005.
- Public Health—Seattle & King County continues to monitor dead birds and mosquitoes for West Nile virus, assist cities and agencies in reducing mosquito habitat, and providing citizens with prevention education.



References

- ¹ CDC. West West Nile Virus Activity — United States, January 1—December 1, 2005. MMWR 2005; 54(49):1253-1256.
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5449a1.htm>
- ² Centers for Disease Control West Nile Information page: <http://www.cdc.gov/ncidod/dvbid/westnile/qa/cases.htm>

Water Quality and Waterborne Illnesses

Water Quality and Waterborne Illnesses

Water is essential to human life and to the health of the environment, and is important in two dimensions: the quality and quantity available. Water quality is defined by chemical, biological and aesthetic (appearance and smell) characteristics. A healthy environment has good water quality that supports a rich and varied community of organisms while also protecting public health.

Water quality influences how communities can use the water for activities such as drinking, swimming or commercial purposes. Groundwater is susceptible to both pollution and depletion. Contamination can occur from improper hazardous material storage, improper pesticide use, rain run-off from roads, and exposure to fecal material, to name a few. Water depletion happens when water recharge is disrupted or removed (as in development) or by using more water from an aquifer than is naturally recharged.

Water systems are regulated by Seattle-King County Department of Public Health (SKCDPH) or the Washington State Department of Health (DOH). Individual private wells are required to be located away from potential sources of contamination during their initial location approval, and ongoing during their use by recorded protective covenants. Individual private wells must be tested for nitrate, arsenic and coliform bacteria, and be found satisfactory prior to any use. Small public water systems (Group B) serve 2 to 14 connections and are not subject to the federal Safe Drinking Water Act, but must meet WA State Board of Health (WAC 246-271) and King County Board of Health Title 12 requirements for water quality and operations. In 2005, King County had 1,483 Group B water systems. Approximately 50% (752) comply with all requirements. About 26% of these systems were sampled for bacterial testing. There were no bacterial outbreaks associated with any Group B system, although some tested positive for coliform and E. Coli bacteria.

Larger community water systems (Group A) serve 15 or more connections, and are regulated by DOH. Each tested water system receives one of four colors that represents the status of the system. Green signifies systems in compliance with drinking water regulations. Yellow represents a questionable compliance status. Blue indicates the system does not meet design requirements or is in excess of approved connections. Red means the system is substantially out of compliance with drinking water regulations. In 2005, there were 214 active Group A systems in King County. Of these, 156 were community systems, 49 were transient non-community, and 9 were non-transient, non-community systems (NTNC). Group A testing showed 61% of the systems were green, 3% were yellow, 34% were blue, and 1% were red.

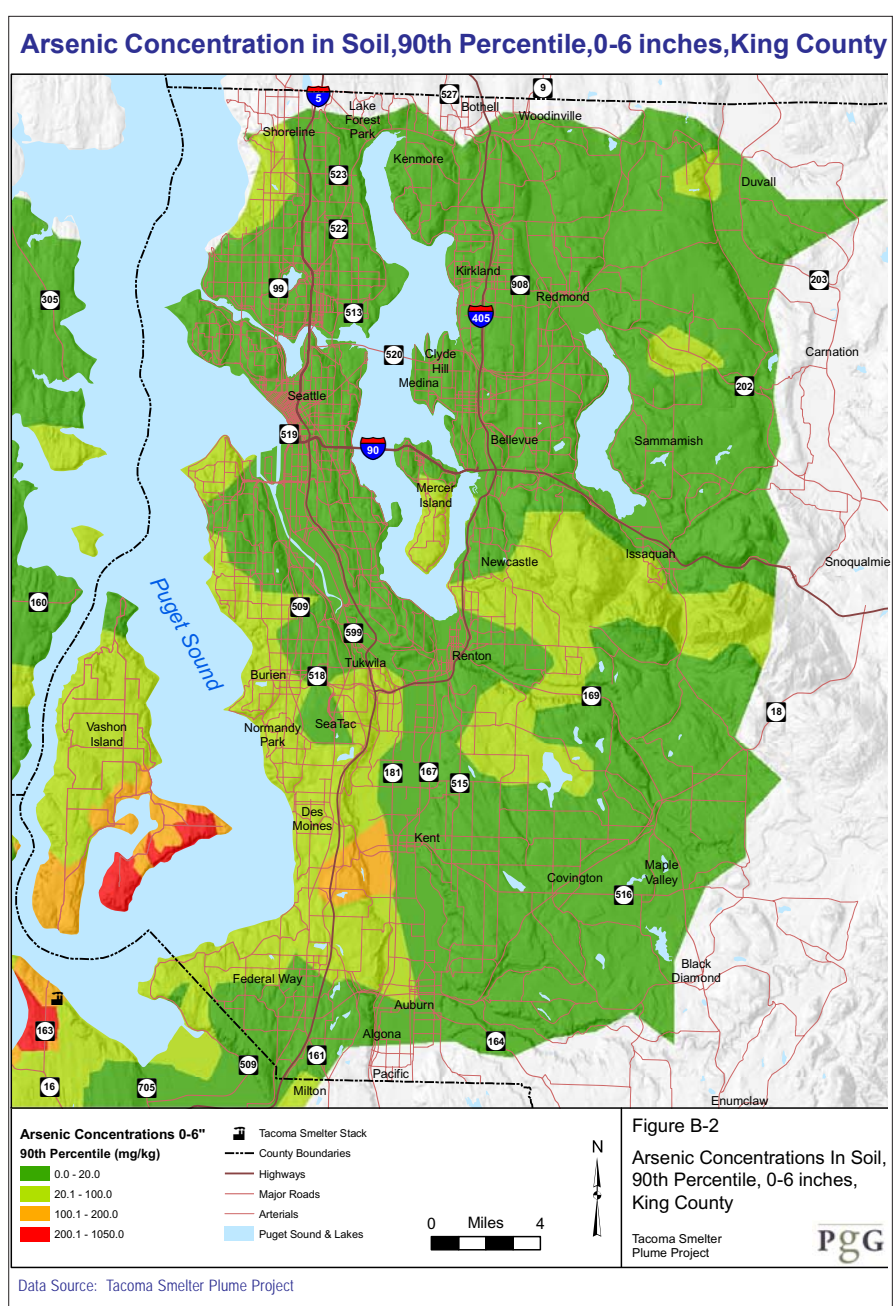
For many years, the drinking water standard for arsenic was 50 parts per billion (ppb). The standard was lowered by the Environmental Protection Agency (EPA) to 10 ppb, which went into effect in January 2006. This new criterion only applies to Group A community water systems serving more than 25 people and NTNC water systems (such as schools and daycares).

Infections which can be transmitted by drinking water include giardiasis, cryptosporidiosis, campylobacteriosis, cyclosporiasis, salmonellosis, and yersiniosis. Nationally, giardiasis and cryptosporidiosis are the most commonly identified culprits in waterborne outbreaks. There were 126 giardiasis cases and 264 cases of cryptosporidiosis, 34 cases of campylobacteriosis, 9 cases of cyclosporiasis, 234 salmonellosis cases, and 15 cases of yersiniosis reported in 2004 in King County, but the proportion of these attributable to residential water systems is unknown. Communicable disease staff who follow up on reportable conditions find that many cases were acquired through travel. Low levels of *cryptosporidium* cysts are found in Seattle water (maximum of 12 per 100 liters); however, most outbreaks are associated with much higher levels of cysts.

Tacoma Smelter Plume

The Asarco Smelter, located in Ruston, Washington, near Tacoma, operated for 96 years as a lead and copper smelter, and was a major domestic producer of arsenic. The surrounding area was designated as an Environmental Protection Agency Superfund site in the early 1980s. Further examination showed wind carried the arsenic and lead-laden smoke, creating a zone of soil contamination that extended further than the Superfund area. This area is called the Tacoma Smelter Plume (TSP).

Washington Department of Ecology and local health jurisdictions in the affected area, including Public Health-Seattle and King County (PHSKC), have been studying and sampling soils in the TSP area for lead and arsenic levels. While the studies show widespread contamination, there is not an immediate health emergency at the levels detected thus far. The primary concerns are about long-term exposure, especially in children, and much of the sampling has occurred in areas where children play frequently, including schools, parks, camps, and childcare facilities.



Inorganic arsenic is extremely toxic, and can cause both acute and long-term health effects. Chronic (long-term) exposure may lead to a variety of symptoms including numbness, cardiovascular disease, diabetes, and vascular disease, or cancer, including skin cancer (non-melanoma), kidney, bladder, lung, prostate, and liver cancer. Washington law requires that arsenic-contaminated soils be cleaned to levels specified in the Model Toxics Control Act (MTCA).¹ Arsenic clean-up levels vary according to the type of contaminated property. The strictest clean up method is 20 parts per million (ppm) for residential areas and 200 ppm for industrial properties.

Lead is also toxic, and children are particularly vulnerable to the effects of lead in their bodies. Chronic exposure may affect the central nervous system, blood pressure, and kidneys. In children, effects range from lowered IQ and reduced growth to balance, memory, and hearing problems. Pregnant women exposed to lead may have babies born prematurely and at lowered birth weights. Washington law requires that lead-contaminated soils be cleaned up to specific levels under the MCTA. The clean-up level for lead is 250 ppm for residential areas and 1000 ppm for industrial.

The map to the left is from a report, Tacoma Smelter Plume Project Extended Footprint Study. It shows the 90% value of arsenic in 0-6 inches or soil. The sample value would be above or below the expected 10% of the time.

The table below summarizes the major TSP sample activity summary since 1999. It does not include small-scale re-sampling and research projects conducted by PHSKC.

Sample activity summary²

To reduce exposure to contaminated soil, PHSKC recommends:

- Keeping children from playing in or eating contaminated dirt.
- Frequently wash toys, pacifiers and other items that go into children's mouths.

- Cover bare soils with bark, grass or other material.
- Wash hands and face thoroughly after working or playing in the soil, especially before eating. Do not eat, chew, or smoke in areas with contaminated soil.
- Wash garden vegetables and fruits carefully to remove all soil particles. Take care to get dirt out of the crevices of vegetables such as broccoli.

FEBRUARY 2006			
Study	Year(s)	Locations sampled	Number of samples
Vashon-Maury Island Footprint (Phase I)	1999-2000	177	436
Vashon-Maury Island Child-Use Areas	2000-2001	34	1503
Mainland Footprint (Phase II)	2001-2002	75	624
Mainland Child-Use Areas (Phase I)	2002-2003	97	2532
Extended Mainland Footprint (Phase III)	2003-2004	185	784
Mainland Child-Use Areas (Phase II)	2004-2005	91*	3580**
* data from draft Summary Report: Tacoma Smelter Plume Phase II, Child Use Areas King County, Washington, PHSKC, June, 2005			
** calculated from data submitted July 2005; does not include duplicate samples			

- Remove work and play shoes before entering the house.
- Wash soil-laden clothes separately from other clothes.
- Damp-mop floors and wipe down counters, tables and window ledges regularly. Do not use a vacuum as a method to keep contaminated dust under control. Vacuum cleaners DO NOT reduce dust and tend to stir it up into your breathing zone.
- Prevent pets from tracking contaminated soils into your home. Keep them out of areas with exposed dirt.
- Make sure you and your children eat a balanced diet with adequate amounts of iron and calcium. Iron and calcium help to prevent lead from becoming a problem in the body.

Please visit the [Ecology](#)³ or [PHSKC web page](#)⁴ for more information about sampling, the TSP project, how to have residential soil sampled, or additional ways to reduce exposure to contaminated soils.

References

¹ www.ecy.wa.gov/biblio/wac173340.html

² Data extracted from reports available on WA Department of Ecology web site <http://www.ecy.wa.gov/>, except for the Mainland Child-Use Areas Phase II, the report for which was not available on this web site as of 2/02/06.

³ http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/

⁴ <http://www.metrokc.gov/health/tsp/arseniclead.htm>